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Authors' Affiliation:

Department of Cardio-Respiratory Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Wardha (Pin code: 442001), Maharashtra, India.

***Corresponding author**

Professor and Head of Department,
Department of Cardio-Respiratory Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Wardha (Pin code: 442001), Maharashtra, India.
Email: vishnudiwakarpt@gmail.com

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Effectual pre and post-operative rehabilitation journey of a patient undergone open heart valves surgery: A case report

Rutuja Bhaskar Parkhi, Moli Jai Jain, Pallavi Rajeshwar Bhakaney, Vishnu Diwakar Vardhan*, Vaishnavi Dilip Yadav

ABSTRACT

The most prevalent reasons for respiratory physiotherapy treatment include pulmonary issues, decreased functional ability, and limitation of movement as a result of heart surgery. The objectives of this case study were to define the use of pre-operative and post-operative protocols in cardiac surgery patients. Physiotherapy was prescribed for 49-year-old female patient detected having rheumatic cardiac disorder having heavy aortic stenosis with mitral stenosis. Breathlessness and pedal edoema were the patient's main complaints, and he had a history of paroxysmal nocturnal dyspnoea. The patient was given pre-operative physiotherapy treatment, which included breathing exercises and ambulation, as well as patient education, prior to cardiac surgery. Following surgery, the patient received Phase 1 in-patient cardiac rehabilitation, which included patient education, sternal precautions, lung cleanliness, bed mobility, and early mobilisation. The data in this case report suggests that the patient's health improved as a result of pre-operative and post-operative care.

Keywords: Rheumatic heart disease, Cardiac Rehabilitation, Physical therapy, Heart Valve surgery

1. INTRODUCTION

Rheumatic heart disease is a non-communicable, preventive condition that can be fatal. It's a complication of acute rheumatic fever, that is frequent in low-income areas (Shimanda et al., 2021). In developing countries, valvular heart disease is caused by rheumatic heart disease in 60-65 percent of cases (Ahmed et al., 2020). Rheumatic cardiac disorders can influence one of the valves, with the mitral valve being the typically affected, subsequently the aortic, tricuspid, and pulmonary valves. Poverty, hunger, and lack of prompt referral are all factors that influence the outcomes (Sampath Kumar, 2020). More than 1/3 rd. of valvular heart disease patients have multivalvular

disease, posing unique diagnostic and treatment challenges (Asami et al., 2019). Mitral valve prolapse, myxomatous mitral valve disease, and a higher incidence of ventricular arrhythmias have all been linked to mitral annular dysfunction (Tsianaka et al., 2021). The occurrence of normal or severe aortic stenosis rises with age, from 0.02 percent to 0.1 percent in adults aged 18 to 44 years to 2.8 percent to 4.6 percent in people aged 75 and older (Kanwar et al., 2018).

Early symptoms include dyspnoea and tiredness; however embolic events can also develop. Prophylactic respiratory physical therapy is recommended after treatment for heart related surgery patients (Chen et al., 2020). It is believed that following heart surgery, pulmonary function declines. General anaesthesia appeared to lower functional residual capacity by about 20%. To lower the trouble of post-operative pulmonary complications, patients undergoing cardiac surgery have better outcomes those incorporate in post-operative cardiac rehabilitation. Cardiovascular surgery combined with pre- and post-operative cardiac rehabilitation focuses on improving life expectancy by enhancing ventricular function and decrease the chance of recurrence.

2. PATIENT INFORMATION

A 49-year-old female came with a chief complaint of breathlessness with New York Heart association (NYHA) grade 3 to 4 and had bilateral pedal edema which was insidious in onset and progressive from foot to middle of the leg. She had the same events 5 years earlier and was diagnosed with significant aortic stenosis, for which she was prescribed medication. She also mentioned a history of paroxysmal nocturnal dyspnoea. Later she was referred to rural hospital where various lab investigations including echocardiography which revealed rheumatic heart disease having critical aortic constriction with heavy mitral constriction and advised surgical correction. The patient was hospitalized to the cardiovascular and thoracic surgery (CVTS) unit on 08/2/22 and was kept under observation and Aortic valve replacement - 23mm TTK Chitra (metallic aortic prosthesis inserted) and Open mitral Valvotomy and Tricuspid valve repair were performed on February 15, 2022. Aortotomy closed in double layers with 5-0 prolene. The patient was moved to CVTS ICU and advised for physical therapy on postoperative on second day.

3. CLINICAL FINDINGS

On postoperative day-2(POD-2), she was inspected while sitting for a long duration having the shoulders levelled equally, rotation of hip in the external direction, and ankle plantar flexed. She was responsive, reactive, and perfectly oriented to time, place, and person. On a numerical pain rating scale, the patient reported discomfort 3/10 near the surgical cut and 8/10 during activities such as bed mobility and coughing. On physical examination, vital signs included a normal temperature range, 76 beats per minute palpitations, and blood pressure of 80/50 mm Hg. The rate of breathing was 18 breaths per minute with a regular rhythm when doing respirational analysis. Expansion of chest was less on left side. On examination, air entry was reduced on both sides, there was a mid-diastolic murmur in the mitral region that expanded to the axilla, an emissive systolic murmur in the aortic area, and an S1 sound was noted.

Timeline

Timeline of the patient from date of admission to the date of follow up is shown in Table 1.

Table 1 Timeline of patient from admission to follow up.

Date of Admission	08/02/2022
Date of Pre-operative Rehabilitation	09/02/2022
Date of surgery	15/02/2022
Date of Postoperative Rehabilitation	17/02/2022
Date of Discharge	03/03/2022
Date of Follow up	18/03/2022

Diagnostic assessment:

The routine blood reports and urine examination did not reveal any abnormality. A 2D echocardiography reported severe aortic stenosis, mild aortic regurgitation, and severe mitral stenosis, all of which were suggestive of rheumatic heart disease. Chest X-ray (Figure 1) shows megalocardia, surgical seam at the sternum region and prosthetic valve.



Figure 1 post-operative X ray shows megalocardia, surgical stem at the sternum region and prosthetic valve.

Physiotherapy treatment

Pre-operative treatment

Patient education about the overall plan of care as well as pre-operative instructions is part of the pre-operative physiotherapy treatment. The routine of physical therapy is started by educating the patient for her existing state, significance of exercises and the strategies. The therapist demonstrates the patient exercises that will be started during the advanced post-operative period that incorporates breathing exercises for the betterment of clearing the airway and the oxygen supply to the lungs, active assisted mobile workouts to enhance the scope of movement for the joint and postural correction. Breathing exercises include diaphragmatic breathing and thoracic expansion routines three sets, in a cycle of 10 each in set while in cough reflex the therapist teaches the patient huffing and coughing techniques that are forced expiratory techniques and advised that the patient perform the procedure twice to three times day for around 10 minutes, and informed the patient about sternal precautions and positioning. Spot marching and then progress to have a walk thrice daily for at least 10 minutes.

Post-operative treatment

Post-operative physical therapy was initiated on the following day of the surgery. Treatment was initiated on post-operative day 2 (POD 2) two times daily to make sure that the chest is free and to relieve the patient soon. Severe discomfort after surgery is caused by surgical disturbances which reduces the capacity of muscles that helps for respiration, limits the motion if chest, glenohumeral joint and spine, and obstructs secretory expectoration. Myofascial release (MFR) technique was performed to improve the functional condition of the patient. MFR technique was performed within the area of the chest wall and the abdominal muscles and the technique was performed once a day for 15 min.

Therapists explain the patient concerning appropriate sternal safeguard, particularly in course of having a cough and transferring. The patient was counselled to cushion the surgical cut having a pillow while coughing to decrease the pain at the incision site and proper technique of putting thoracic binders and their importance (Figure 2A). To encourage clear way for the air and coughing methods for 10 minutes 2-3 times a day. Diaphragmatic breathing (Figure 2B), segmental routines for clear respiration three sets, with a cycle of ten repetitions in each set and then progress having a hold for three seconds, incentive spirometry was performed 2 hourlies during awake time before lunch. Figure (2C) shows thoracic expansion exercises which were started to improve lungs volume for 10 repetitions and 2 sets.

Aerobic routines including exercises for scope of movements, ankle toe movements, spot marching, and supervised graded inward ambulation twice daily. The home exercise program was also prescribed which includes the same set of instructions was given to the patient including the patient education and self-monitoring was taught. She was educated about a home exercise routine with monitoring of vitals and symptom recognition and appropriate activity guidelines.

Follow up

Pre-operative and post-operative physiotherapy treatments were provided, as well as a home exercise programme. There was improvement seen in all the outcome measures during discharge. Follow up after 4 weeks, she was greatly influenced and performed every action of daily living.



Figure 2 A: Therapist counselled the patient related to thoracic binders; B: Patient performing diaphragmatic breathing; C: Patient doing shoulder mobility exercise with thoracic expansion exercise

Outcome Measures

Table 2 shows the improvement in Outcome measures of the patient

Table 2 week-wise improvement in outcome measures

Outcomes	Day 1	Week 1	Week 2
Borg Scale	9	5	2
Incentive Spirometer	600 cc	900 cc	1200 cc
New York heart association functional classification grade	Grade 4	Grade 3	Grade 2
Kansas City Cardiomyopathy Questionnaire Scoring	23	42	65

4. DISCUSSION

RHD persists to be a vital reason for avoidable death as well as disorders in adults. Pre-operative exercise training can help to avoid complications after the operation in cardiac surgery which is similar to the current study (Zheng and Zhang, 2020). Pre-operative interventions include education about post-operative care or include pre-operative care for respiration along with routines which were planned to raise the strength before operation, as in the current study (Denehy et al., 2018). Breathing exercises are indicated for cardiac patients in the early postoperative phase to enhance lung function (Westerdahl, 2015). Massage therapy is effective to reduced anxiety when started on day 3 after surgery, as intravenous lines and chest tubing are separated, and patients communicate efficiently with family and Clinical team, which contradicts to this study (Grafton-Clarke et al., 2019; Tsianaka et al., 2021). The study conducted on the patient of cardiac surgery shows that MFR was beneficial for the patient in post cardiac surgery which is similar to this study (Ratajska et al., 2020).

5. CONCLUSION

Cardiac recovery revealed an effective treatment for people who have had heart surgery. The available evidence on the efficacious improvement in the patient's general condition through cardiac rehabilitation is also supported by this single case study. The therapy significantly improved the patient's overall quality of life and lung capacity. As a result, individuals who have undergone valve replacement procedures can benefit from phase 1 cardiac rehabilitation.

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Author's contribution

All authors have made their best contribution to the collection of data, the planning of the protocol, its implementation, and the preparation of the case report.

Informed consent

Written and oral informed consent was obtained from the patient included in the study.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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